



TETRA TECH

January 18, 2008

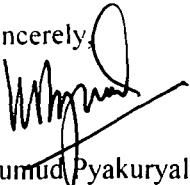
Mr. Roy Crossland
START Project Officer
U.S. Environmental Protection Agency, Region 7
901 North 5th Street
Kansas City, Kansas 66101


**Subject: Draft Hazard Ranking System Scoring Memorandum
United Zinc No. 1, Iola, Kansas
EPA ID: KSN000705026
U.S. EPA Region 7 START 3, Contract No. EP-S7-06-01
Task Order No. 0038.000
Task Monitor: Paul Roemerman, Site Assessment Manager and Kansas State
Coordinator**

Dear Mr. Crossland:

Tetra Tech EM Inc. is submitting the attached Hazard Ranking System scoring memorandum and scoresheet for the above-referenced facility. The overall score of 50 was based on the soil migration and surface water pathways. If you have any questions or comments, please call the project manager at (816) 412-1778.

Sincerely,


Kumud Pyakuryal
START Project Manager


Ted Faile, PG, CHMM
START Program Manager

Enclosure





CONFIDENTIAL

**PRELIMINARY HAZARD RANKING SYSTEM
UNITED ZINC NO. 1
IOLA, KANSAS**

EPA ID: KSN000705026

Date Scored: January 2008

INTRODUCTION

This draft Hazard Ranking System (HRS) scoring report is for the United Zinc No. 1 (United Zinc) site, located in Iola, Allen County, Kansas. The United Zinc facility is located on the north side of Highway 54 along Kansas Drive, and is the location of the former United Zinc and Chemical Company Zinc and Lead Smelter (United Zinc). This report was developed using HRS guidelines to evaluate groundwater (S_{gw}) migration, surface water (S_{sw}) migration, soil exposure (S_{se}), and air migration (S_{air}) pathways. The groundwater migration and air migration pathways were not scored due to lack of data. The preliminary score for the site is as follows:

Pathway Score

S_{gw}	=	Not Scored
S_{sw}	=	1.07
S_{se}	=	100.00
S_{air}	=	Not Scored
OVERALL HRS SCORE	=	50

The overall site score of 50 is based on the soil exposure and surface water pathways. This score is based on lead-contaminated soils, detected at concentrations requiring a time-critical removal action, which exceed the Kansas Department of Health and Environment (KDHE) Risk-Based Standards for Kansas (RSK) Residential Soil Pathway value for lead. Surface soil samples collected during the Preliminary Assessment (PA) and the surface water and sediment samples collected during the Site Inspection (SI) provided the analytical data used to score the site.

SITE DESCRIPTION AND HISTORY

The former United Zinc facility is located on the east side of Iola, Allen County, Kansas within a mixture of residential and commercial properties. It is located in Sections 25 and 36 of Township 24 South, Range 18 East (KDHE 2005), as depicted on the U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map of Iola, Kansas (USGS 1984). The approximate geographic coordinates for the central portion of the facility are 37.9222800 degrees north latitude and 95.385900 degrees west longitude

(Maxim Technologies, Inc. [Maxim] 2003). The location of the facility is shown in Attachment 1, Figure 1.

The former United Zinc smelter facility is comprised of 10 parcels of land, equivalent to approximately 17 acres, but the overall site area evaluated includes a much larger surrounding section. The property has been graded, leveled, and developed since the former smelter operations ceased in the 1920s (Maxim 2003). Most of the property where the former smelter was located is vacant but includes the following businesses: Brenntag Southwest, Inc. (Chemical Distribution Company), a MFA Distributor, the Superflea Flea Market, Tucker's Flea Market, a portion of a concrete mixing facility, and some pastureland (Maxim 2003, KDHE 2005). The facility is bordered on the north by residential properties; on the east by the East Iola Site (the location of the former Prime Western Smelting Company Works No. 3 and J.B. Kirk Gas and Smelting Company), a car wash, a former Tyson processing facility, and a movie theater; on the south by a restaurant, a dry cleaner, a car dealership, and agricultural land; and on the west by the Colberly Site (the location of the former United Iron Works Company), a truck repair facility, and the remaining portion of the concrete mixing facility (Maxim 2003). The facility is also surrounded by residential neighborhoods and two schools (KDHE 2005). The Iola Preschool for the Exceptional (Iola Preschool) is located northeast of United Zinc, and the McKinley Elementary School (McKinley School) is located southwest of United Zinc (Terranext 2005). The facility layout is shown in Attachment 1, Figure 2.

According to the historic plat maps and Sanborn fire insurance maps, activities at the United Zinc facility began as early as 1901. At that time, the facility was called the Standard Acid Company and included three furnaces, 12 retorts, and a pottery room with kilns. Mr. William Lanyon owned the property between 1901 and 1902. The property was transferred to United Zinc in 1902. United Zinc and Chemical Company owned and operated the primary zinc smelter until approximately 1912. No known active smelting facilities were documented on the property after 1912. Historical documentation indicates that the United Zinc facility contained four furnaces, eight kilns, 14 retorts and several ore crushers and roasters (KDHE 2005). The United Zinc facility was designed to capture the sulfur dioxide fumes generated during roasting the ore to make sulfuric acid; therefore, United Zinc likely utilized the acid chambers associated with the Standard Acid facility (KDHE 2006).

During the 2003 Phase I site reconnaissance, smelter waste was observed at United Zinc, and the quantity was estimated as approximately 1,800 cubic yards, concentrated in the southwest corner of the vacant property at United Zinc (Burns & McDonnell Engineering Company, Inc. [Burns & McDonnell] 2004,

Terranext 2005). Zinc smelter waste is known to contain elevated concentrations of heavy metals from smelting activities—including arsenic, cadmium, lead, and zinc. Sampling of the soil, groundwater, sediment, surface water, smelter waste, and surrounding areas began in 2004 to determine the potential impact from the former smelting operations at United Zinc. Additional sampling was conducted in March of 2007 to identify background levels of arsenic and lead in the soil near the site, collect surface water and sediment samples from areas where runoff drains from the site, and to collect surface water from the surface water intake in the Neosho River that provide the drinking water supply to the residents of Iola.

PREVIOUS INVESTIGATIONS

A Phase I Focused Former Smelter Assessment (FFSA) was completed on behalf of the KDHE State Water Plan (SWP) program in December 2003. The FFSA identified a Recognized Environmental Condition (REC) at United Zinc based on observation of smelter waste during the site reconnaissance. The smelter waste appeared to have impacted the vegetative growth in the area of the former smelter operations. In addition, elevated concentrations of lead had been previously documented in the surface soils on the property immediately adjacent to United Zinc from other documented smelting operations, including the East Iola Site and the Colberly Site. A Phase II Assessment was recommended at United Zinc and in the area surrounding the smelting activities to investigate the potential risk of human exposure to heavy metal-impacted waste and surface soil (Maxim 2003).

Sampling of the soil, smelter waste, groundwater, surface water and sediment was conducted during the Phase II FFSA at United Zinc in December 2004 on behalf of the KDHE SWP. The sampling identified elevated levels of arsenic, cadmium, lead, and zinc above the background soil sample concentrations. The Phase II FFSA also indicated potential contamination near residents and at both the McKinley School and the Iola Preschool (Burns & McDonnell 2004, KDHE 2005).

KDHE collected samples in June 2005 from 50 residential yards located between United Zinc and the McKinley School and the Iola Preschool. Arsenic was detected above its KDHE Risk-Based Standards for Kansas (RSK) Residential Soil Pathway level of 11 milligrams per kilogram (mg/kg) in 18 of the residential samples (Terranext 2005, KDHE 2003). In addition, lead was found above its KDHE RSK Residential Soil Pathway level of 800 mg/kg in 12 of the residential samples, some of the same samples with elevated arsenic concentrations. Cadmium and zinc were detected in all of the soil samples at concentrations below their KDHE RSK Residential Soil Pathway values (Terranext 2005; KDHE 2003, 2005).

A Preliminary RSE was conducted by KDHE in September 2005. In support of the 2005 RSE, KDHE collected additional samples from sensitive receptor areas near United Zinc, including the McKinley School and Iola Preschool. The results exhibited elevated levels of arsenic, cadmium, lead, and zinc at residential and non-residential properties. The presence of lead above 400 mg/kg was also identified within the McKinley School playground and adjacent areas. The Preliminary RSE recommended further removal site evaluation and removal action consideration (KDHE 2005).

Tetra Tech, under contract to the EPA, prepared a RSE report in September 2006. The sampling activities for the RSE were conducted during April and May 2006. During the RSE, approximately 260 properties were screened for lead using a XRF, and approximately 10 percent of the screened samples were submitted for laboratory confirmation analyses for arsenic, barium, cadmium, lead, and zinc. Thirty-four properties were identified where either the XRF and/or laboratory data indicated lead concentrations warranting a time-critical removal action (400 mg/kg for schools and daycares; 800 mg/kg for residential properties; and 1,000 mg/kg for commercial properties). The 34 properties included 19 private residences, 10 daycare facilities, two elementary schools, and three commercial properties (Tetra Tech 2006a). In addition, 91 residential properties contained concentrations of lead between 400 mg/kg and 800 mg/kg (Tetra Tech 2006a).

In February 2007 a PA report was completed. It summarized the sampling activities conducted at United Zinc from August to November 2006. During the PA activities, approximately 500 residential properties were screened for lead using a XRF and 180 soil samples were submitted for laboratory confirmatory analyses of arsenic, cadmium, lead and zinc. The laboratory results found arsenic detected in 160 of the confirmatory soil samples at concentrations exceeding its Superfund Chemical Data Matrix (SCDM) Cancer Risk (CR) screening concentration of 0.43 mg/kg. In addition, 32 of those samples had concentrations that exceeded the SCDM Reference Dose (RfD) screening concentration of 23 mg/kg for arsenic (EPA 2004). The background concentrations of arsenic ranged from 8 mg/kg to 13 mg/kg. Barium and zinc were detected in all the soil samples at concentrations below their SCDM RfD screening concentrations of 5,500 mg/kg and 23,000 mg/kg, respectively (EPA 2004). Cadmium was detected in one soil sample at a concentration of 45.4 mg/kg, which exceeds its RfD screening concentration. The remaining soil samples contained concentrations of cadmium below its RfD screening concentration of 39 mg/kg (EPA 2004). In June 2007 KDHE updated the Risk-Based Standards for Kansas Manual and the Residential Soil Pathway value was decreased to 400 mg/kg (KDHE 2007a). A total of 148 soil samples analyzed by the laboratory during the PA contained lead concentrations exceeding the KDHE RSK

Residential Soil Pathway value of 400 mg/kg. All of these samples also exceeded lead background concentrations defined during the PA that ranged from 176 mg/kg to 397 mg/kg (Tetra Tech 2007a).

It was unclear if the background samples collected during the PA were contaminated with lead or if the concentrations detected were representative of background concentrations of lead in soil in the area. Additional samples were recommended to be collected north of the facility to identify and verify site-specific background concentrations of lead in the soil.

SI SAMPLING

In March 2007, Tetra Tech in support of EPA conducted additional sampling to help identify site-specific background levels of arsenic and lead in the soil, collect surface water and sediment samples from areas where runoff drains from the site, and to collect surface water samples from the surface water intake along the Neosho River that provide the drinking water supply to the residents of Iola. Tetra Tech prepared a site-specific Quality Assurance Project Plan (QAPP) for United Zinc. The QAPP was approved by EPA subsequent its submission at the beginning of March 2007 (Tetra Tech 2006b). Field activities were conducted in accordance with the approved QAPP. Samples for Analytical Services Request (ASR) 3396 were hand delivered to the EPA Region 7 laboratory. The analytical data were validated by EPA Region 7 Quality Assurance personnel.

Soil Sampling

The purpose of collection of additional soil samples during the SI was to identify site-specific background concentrations of arsenic and lead in an area not impacted by the former smelting processes of United Zinc. The sampling locations were selected from a residential neighborhood 1.25 mile north of United Zinc facility boundary. The sample locations are summarized in Table 2. The screening process delineated each residential property selected for screening into at least four cells. The cells radiated out 100 feet from the drip zone around the house or until the property line was reached, whichever was less. The maximum size of each cell was 100 feet by 100 feet. Additional areas or cells that were screened include the drop zone; fine-grained material if used in driveways, sidewalks, or under carports; vegetable gardens; and children's play areas that were at least 25 feet by 25 feet. A composite sample consisting of nine aliquots, each collected from 0 to 2 inches bgs, was collected from each cell and placed in a labeled, sealed plastic bag. All samples were transported to the sample preparation facility and placed in clean, dedicated aluminum pie pans. The samples were dried completely, homogenized, passed through a sieve, and then screened for lead using a XRF. An average of three readings were calculated and recorded on the residential property screening forms. All five of the residential screened soils samples were submitted

to the EPA Region 7 laboratory for confirmation analyses for arsenic and lead. Locations of the samples submitted to the laboratory are illustrated on Figure 3 (see Appendix A).

Arsenic was detected in two of the five residential background soil samples ranging from 5.09 mg/kg to 7.22 mg/kg. All of the background sample concentrations exceeded the arsenic CR screening concentration of 0.43 mg/kg but below the arsenic RfD screening concentration of 23 mg/kg (EPA 2004). The background concentrations of arsenic identified during the PA sampling activities were slightly higher than the SI results and ranged from 8 mg/kg to 13 mg/kg (Tetra Tech 2007a). The concentrations of arsenic detected in the background soil samples during the SI appear to be naturally occurring since the average arsenic concentration documented in Allen County by the USGS is 9.8 mg/kg (USGS 2007).

Lead was detected in all five of the residential background soil samples and the concentrations ranged from 21.0 mg/kg to 122 mg/kg. All the lead concentrations detected in the background samples were well below the KDHE RSK Residential Soil Pathway value of 400 mg/kg. The background concentrations of lead identified during the PA sampling activities ranged from 176 mg/kg to 397 mg/kg (Tetra Tech 2007a), but the documented average lead concentration for soil in Allen County according to the USGS is 27.2 mg/kg (USGS 2007). The background levels of lead near the former United Zinc facility identified during the SI are higher than the documented county average of 27.2 mg/kg but below the concentrations previously identified as background concentrations in the PA.

Groundwater Sampling

Although the primary water source of drinking water for the City of Iola is surface water, groundwater samples were proposed to be collected from five private drinking water wells including one background well during the SI (EPA 2007a). According to the Kansas Geological Survey (KGS) database, approximately 109 registered wells are within 4 miles of the former United Zinc facility; however, only eight domestic wells are listed as active (KGS 2007). The private drinking water wells proposed to be sampled were selected from the active wells identified in the KGS database. Only the background private well was sampled during the SI activities due to inability to obtain access or to locate the wells using the locational information provided in the KGS database. This well is actively used for lawn care and for an ornamental pond that contains fish. The groundwater sample was collected from a tap/spigot located nearest the well head, prior to any treatment system. The system lines were purged for approximately 5 minutes before the sample was collected. Water quality parameters (pH, conductivity, and temperature) were measured and the sample was collected after the parameters stabilized.

Neither arsenic nor lead was detected in the background groundwater sample collected from the private well located on East Garfield Road in Iola.

Surface Water and Sediment Sampling

The purpose of collecting surface water and sediment samples from the natural drainage areas during the SI was to determine if a release of contaminants has occurred from the former United Zinc facility to nearby creeks. Surface water runoff from United Zinc drains into Rock Creek, which is located approximately 0.25 to 0.5 mile east/southeast of the former smelter property. Rock Creek drains into Elm Creek which drains into the Neosho River; the confluence of Rock Creek and Elm Creek is located approximately 0.75 mile due south of the United Zinc facility. The confluence of Elm Creek and the Neosho River is about 1.5 mile east/southeast of the facility. During the SI surface water and sediment samples were collected from Rock Creek southeast of the facility and from Elm Creek southwest of the facility as illustrated on Figure 3 of the SI report.

Arsenic was detected in two of the sediment samples at concentrations ranging from 4.48 mg/kg to 27.3 mg/kg. Lead was detected in all six of the sediment samples including the background samples. The concentrations of lead detected in the sediment samples ranged from 27.2 mg/kg to 1,100 mg/kg. Based on the lead concentrations, a segment of actual contamination was established between sediment samples 3396-9 and 2296-11 starting in Rock Creek and leading into Elm Creek because they exceeded three times the background concentration.

Arsenic was not detected in any of the surface water samples collected during the SI, and lead was only detected in sample 3396-104 at a concentration of 16.8 µg/L. The concentration of lead detected in the surface water sample from Rock Creek was below the SCDM environmental acute criteria maximum concentration (CMC) and the chronic criteria continuous concentration (CCC) for fresh water.

Surface Water Intake Sampling

As part of the SI surface water samples were collected from three locations along the Neosho River including one background sample located upgradient of the surface water intake. The purpose of collecting these surface water samples was to determine if the drinking water source for the City of Iola was impacted by the former United Zinc facility.

Arsenic was not detected in the surface water samples collected near the surface water intake, but was detected in the background surface water sample at a concentration of 4.38 µg/L. Lead was detected at

low levels in all three surface water samples but the highest concentration (6.45 µg/L) was detected in the background surface water sample.

GROUNDWATER PATHWAY

No release groundwater samples were collected as part of the SI activities. The primary source of drinking water for the City of Iola is surface water. According to the Kansas Geological Survey database, approximately 109 registered wells are within 4 miles of the former United Zinc smelter facility; however, only eight domestic wells are listed as active (Kansas Geological Survey 2007). The private drinking water wells proposed to be sampled were selected from the active wells identified in the KGS database. Only the background private well was sampled during the SI activities due to inability to obtain access or to locate the wells using the locational information provided in the KGS database.

SUMMARY AND CONCLUSIONS

This site generated a preliminary overall score of 50, based on documented lead-contaminated soils. In 83 residential yards during the PA, lead was detected at concentrations exceeding its KDHE RSK Residential Soil Pathway value of 800 mg/kg; lead was detected above its KDHE RSK value of 400 mg/kg at two schools.

SURFACE WATER PATHWAY

According to the topography of the land near the United Zinc facility the anticipated direction of stormwater runoff is to the south-southeast towards Rock Creek. Based on visual observations made during the site reconnaissance conducted on behalf of KDHE in 2003, surface drainage from the site was directed toward a drainage ditch located north of the facility that drained into a ditch that flowed southeast towards Rock Creek. Rock Creek located east of the former smelter property drains into Elm Creek, and Elm Creek drains into the Neosho River located southwest of the United Zinc facility.

The primary source of drinking water for the City of Iola is surface water (EPA 2007a). Two drinking water intakes exist on the Neosho River, and two drinking water intakes exist upstream on the west side of the City of Iola on the Neosho River. The nearest surface water intake is two miles west of the facility on the Neosho River. The former United Zinc facility is located within the Upper Neosho Watershed (EPA 2007c). According to the KDHE Kansas Surface Water Register the surface water in Iola, Kansas is listed for general purpose with expected aquatic life, primary recreation use, and food procurement (KDHE 2007b).

Surface water and sediment samples were collected from the natural drainage areas near the former United Zinc facility during the SI to determine if a release of contaminants has occurred to nearby creeks. During the SI surface water and sediment samples were collected from Rock Creek southeast of the facility and from Elm Creek southwest of the facility. Arsenic was detected in two of the sediment samples, and lead was detected in all six of the sediment samples including the background sample. Based on the lead concentrations detected in the sediment samples a segment of actual contamination was established between sediment samples 3396-9 and 2296-11 starting in Rock Creek and leading into Elm Creek because they exceeded three times the background concentration (81.6 mg/kg). The overland segment extends from the drainage ditch located north of the facility to the probable point of entry is where the ditch drain surface water runoff into Rock Creek. The 15-mile target distance limit extends from Rock Creek into Elm Creek and ends in the Neosho River.

Arsenic was not detected in the surface water samples and lead was only detected in sample 3396-104 at a concentration well below SCDM benchmarks.

During the SI two surface water samples were also collected near the main surface water intake on the Neosho River upstream of the United Zinc facility. Arsenic was not detected in these samples. Lead was detected in both of the surface water samples collected near the surface water intake, but the concentrations detected were below the background surface water sample concentrations that was collected upgradient of the surface water intake. The metals detected in the source samples and in the surface soil have not impacted the drinking water intake located along the Neosho River.

LIKELIHOOD OF EXPOSURE

An observed release to the surface water pathway was documented in one or more locations during the SI, resulting in a likelihood of exposure score of 550. This is based on lead concentrations identified during the SI in sediment samples collected from Rock and Elm Creek exceeding three times the background concentration of lead identified in Rock Creek north of Highway 54. Historical operations at the facility include the former United Zinc and Chemical Company Zinc and Lead Smelter. Smelting operations have been documented to cause massive amount of pollution in the general vicinity of the facility. Burning coal to operate the smelters created soot contaminated with elevated levels of arsenic, lead, cadmium, and zinc. In addition, these processes generated large volumes of solid waste, including impure smelting slag and slag blown from retorts at the end of the smelting process. Most of the waste generated from these smelters was left after the operations ceased for future generations to address (KDHE 2006).

WASTE CHARACTERISTICS

Hazardous waste quantity and toxicity as related to the surface water pathway are discussed in this section. For this scenario, arsenic and lead-contaminated soil was documented on the smelter waste pile located on the former United Zinc property. The smelter waste quantity was estimated at 1,800 cubic yards; thus, as per Table 2-5 of the HRS Rule, the 1,800 cubic yards was divided by 2.5 for a pile to arrive at a value of 720. Subsequently, based on Table 2-6 and Section 2.4.2.2 of the HRS Rule, Hazardous Waste Quantity Factor Value (HWQFV) of 100 was assigned (EPA 1990).

The driving hazardous constituent for the surface water pathway is lead. A persistence factor value 1 is assigned based on the half-life of lead, and a toxicity value of 10,000 was assigned for lead based on SCDM factor table (EPA 2004). Given a persistence value of 1 and a toxicity factor of 10,000, a toxicity/persistence factor value of 10,000 is assigned based on Table 4-12 in the HRS Rule. A HWQFV of 100 was assigned based on the area of the smelter waste and contaminated soil at United Zinc. Given a toxicity/persistence factor of 10,000 and a HWQFV of 100, the waste characteristics (WC) value of 32 was assigned based on Table 2-7 in the HRS Rule (EPA 1990). Because surface water migration pathway threats for human food chain and environmental were considered for scoring purposes, lead bioaccumulation, toxicity, and persistence, and resulting waste characteristic values are not discussed here.

SURFACE WATER TARGETS

This section discusses target factor values for the surface water pathway, including the nearest intake, population, and resources.

The primary source of drinking water for the City of Iola is surface water (EPA 2007a). Two drinking water intakes exist 8 miles downstream of United Zinc, on the Neosho River, and two drinking water intakes exist upstream on the west side of the City of Iola on the Neosho River. The nearest surface water intake is two miles west of the facility on the Neosho River. The former United Zinc facility is located within the Upper Neosho Watershed (EPA 2007c). According to the KDHE Kansas Surface Water Register the surface water in Iola, Kansas is listed for general purpose with expected aquatic life, primary recreation use, and food procurement (KDHE 2007b).

Nearest Intake

The nearest downstream intake is located on the Neosho River. However, based on the SI sampling data, no segment of observed contamination was established on the river, because the background values for target contaminants were higher.

Environmental Targets

Based on contaminated sediment samples 3396-9, 3396-10, and 3396-11, a segment of contamination was identified on Rock Creek. The segment of actual contamination was estimated to be greater than 5,500 feet. Potential wetlands located within this segment were not scored during the SI due to the lack of area wetland inventory information.

Surface Water Pathway Conclusion

Surface water and sediment samples were collected from the natural drainage areas near the former United Zinc facility during the SI to determine if a release of contaminants has occurred to nearby creeks. During the SI surface water and sediment samples were collected from Rock Creek southeast of the facility and from Elm Creek southwest of the facility. Arsenic was detected in two of the sediment samples, and lead was detected in all six of the sediment samples including the background sample. Based on the lead concentrations detected in the sediment samples a segment of actual contamination was established between sediment sample locations 3396-9 and 2296-11 starting in Rock Creek and leading into Elm Creek because they exceeded three times the background concentration. The overland segment extends from the drainage ditch located north of the facility to the probable point of entry is where the ditch drain surface water runoff into Rock Creek.

The 15-mile target distance limit extends from Rock Creek into Elm Creek and ends in the Neosho River as shown on Figure 3; please note that the Neosho River is the surface water body where sample numbers 3396-201, 3396-202, and 3396-203 were collected. Arsenic was not detected in the surface water samples and lead was only detected in sample 3396-104 at a concentration well below SCDM benchmarks. During the SI two surface water samples were also collected near the main surface water intake on the Neosho River upstream of the United Zinc facility. Arsenic was not detected in these samples. Lead was detected in both of the surface water samples collected near the surface water intake, but the concentrations detected were below the background surface water sample concentrations that was collected upgradient of the surface water intake. The metals detected in the source samples and in the surface soil have not impacted the drinking water intake located along the Neosho River. Due to the lack

of identified targets on nearby creeks and background concentrations greater than downstream samples on the Neosho River, the overall pathway score was 1.07.

SOIL EXPOSURE AND AIR PATHWAY

The likelihood of exposure value was assigned a value of 550 based on a release to the soil exposure pathway. This is based on arsenic and lead concentrations, identified during the PA in residential surface soil samples, exceeding the SCDM CR and RfD screening concentrations for arsenic and the KDHE RSK value for lead. Lead was the primary contaminant of concern during the field screening process during the PA. Therefore, lead was used to score the United Zinc site. Lead was detected at concentrations in 148 residential yards exceeding the KDHE RSK Residential Soil Pathway value of 400 mg/kg. The HWQFV was assigned a value of 100 based on the hazardous substance (lead) documented as present. A toxicity factor of 10,000 was assigned based on the hazardous constituent (lead) documented. Therefore, a waste characteristics value of 32 was assigned. The site was scored based on resident individual, resident population, potential targets, and workers.

The resident individual was assigned a score of 45 based on residents living or attending school or daycare on or within 200 feet of Level II contamination. The Level II target population is 725.64, computed by summing: (1) the product of the number of residential soil samples collected that exceed the KDHE RSK value times the average number of persons per household in Allen County plus (2) the student body total for both Jefferson Elementary School and the McKinley Elementary School. The workers factor was assigned a value of 5, the resources factor was assigned a value of 0, and the terrestrial sensitive environment was assigned a value of 0. This resulted in a targets factor category score of 775.64. Based on the likelihood of exposure, waste characteristics, and targets values, the site was assigned a groundwater migration pathway score of 100.

Allen County is located within the Osage Plains and the land is dominantly level with few outstanding differences in the relief of the land. The U.S. Department of Agriculture (USDA) has classified soil in the area as Kenoma silt loam. The Kenoma soil type is described by the USDA as deep, moderately well-drained, very slowly permeable soils on the uplands. These soils are formed in material weathered from sediments high in content of silt and clay (USDA 1978).

United Zinc is located on approximately 17 acres of land within the city limits of Iola, Kansas. Most of the land is vacant, but the businesses currently on the property include: Brentagg Southwest, Inc., MFA, Superflea Flea Market, Tucker's Flea Market, and portion of a concrete plant (Maxim 2003,

KDHE 2005). The area surrounding the former United Zinc facility is predominantly residential, and the total population within the 4-mile target distance limit (TDL) from the center of the United Zinc property is approximately 8,076 people. Census information indicated 193 residents within 0.25 mile; 1,066 individuals between 0.25 and 0.5 mile; 2,222 people between 0.5 and 1 mile; 3,456 residents between 1 and 2 miles; 861 people between 2 and 3 miles; and 278 individuals between 3 and 4 miles from the United Zinc facility (Missouri Census Data Center 2005). In addition, five schools and two daycares are mixed in with the residential areas surrounding United Zinc.

Arsenic was detected in 160 soil samples collected during the PA at concentrations exceeding its SCDM CR screening concentration of 0.43 mg/kg, ranging from 5.91 mg/kg to 178 mg/kg. In addition, 32 of those samples had concentrations that exceeded the SCDM RfD screening concentration of 23 mg/kg for arsenic (EPA 2004). The background concentrations of arsenic ranged from 8 mg/kg to 13 mg/kg. Barium and zinc were detected in all the soil samples at concentrations below their SCDM RfD screening concentrations of 5,500 mg/kg and 23,000 mg/kg, respectively (EPA 2004). Cadmium was detected in soil sample 3157-6 at a concentration of 45.4 mg/kg, which exceeds its RfD screening concentration. The remaining soil samples contained concentrations of cadmium below its RfD screening concentration of 39 mg/kg (EPA 2004). The lead concentrations for the soil samples collected during the PA are included in Attachment E. A total of 83 soil samples analyzed by the EPA Region 7 Laboratory contained lead concentrations exceeding lead's KDHE RSK Residential Soil Pathway value of 800 mg/kg, ranging in concentrations from 805 mg/kg to 8,390 mg/kg. Background concentrations of lead identified northwest of the United Zinc facility ranged from 176 mg/kg to 397 mg/kg.

No air pathway samples were collected because actual or potential contamination to the air migration pathway was not considered significant. The purpose of the SI was identify site-specific background levels of arsenic and lead in the soil, collect surface water and sediment samples from areas where runoff drains from the site, and collection of surface water samples from the surface water intake along Neosho River that provide the drinking water supply to the residents of Iola.

LIKELIHOOD OF EXPOSURE

An observed release to the soil exposure pathway was documented in one or more locations during the PA, resulting in a likelihood of exposure score of 550. This is based on arsenic and lead concentrations identified during the PA in residential surface soil samples exceeding the SCDM CR and RfD screening concentrations for arsenic and the KDHE RSK value of 400 mg/kg for lead. Historical operations at the facility include the former United Zinc and Chemical Company Zinc and Lead Smelter. Smelting

operations have been documented to cause massive amount of pollution. Burning coal to operate the smelters created soot contaminated with elevated levels of arsenic, lead, cadmium, and zinc. In addition, these processes generated large volumes of solid waste, including impure smelting slag and slag blown from retorts at the end of the smelting process. Most of the waste generated from these smelters was left after the operations ceased for future generations to address (KDHE 2006).

WASTE CHARACTERISTICS

Hazardous waste quantity and toxicity as related to the soil exposure pathway are discussed in this section. For this scenario, arsenic and lead-contaminated soil was documented in the soils at United Zinc. The smelter waste quantity was estimated at 1,800 cubic yards which equals 16,200 square feet assuming a height of 3 feet, and the total area of the contaminated soil quantity was estimated to be 38,279,271 square feet. To calculate the area of the smelter waste the pile size was divided by 34 and the area of the contaminated soil was calculated by dividing the total by 34,000. The Hazardous Waste Quantity total for the smelter waste and contaminated soil equaled 1,601 square feet, and a Hazardous Waste Quantity Factor Value (HWQFV) of 100 was assigned based on the HRS rule Section 2.4.2.2 (EPA 1990).

The driving hazardous constituent for the soil exposure pathway is lead. A toxicity value was based on SCDM factor table (EPA 2004). A toxicity factor value of 10,000 was assigned for lead (EPA 2004) based on Table 3-9 in the HRS Rule (EPA 1990). A HWQFV of 100 was assigned based on the area of the smelter waste and contaminated soil at United Zinc. Given a toxicity factor of 10,000 and a HWQFV of 100, the waste characteristics (WC) value of 32 was assigned based on Table 2-7 in the HRS Rule (EPA 1990).

SOIL EXPOSURE TARGETS

This section discusses target factor values for the soil exposure pathway, including the resident individual, resident population, workers, resources, and terrestrial sensitive environments.

United Zinc is located on approximately 17 acres of land within the city limits of Iola, Kansas. Much of the land is vacant, but the businesses currently on the property include: Brentagg Southwest, Inc., MFA, Superflea Flea Market, Tucker's Flea Market, and portion of a concrete plant. Beyond those commercial properties, the area surrounding the former United Zinc facility is predominantly residential. In addition, five schools and two daycares are mixed in with the residential areas surrounding United Zinc.

Resident Individual

Based on the HRS Rule, a score of 45 was assigned because people are living and/or attending school or daycare on or within 200 feet of contaminated soil. The contaminated soil documented during the PA sampling is considered Level II contamination since it exceeds the KDHE RSK values.

Resident Population

Lead-contaminated soil exceeding the KDHE RSK Residential Soil Pathway value of 400 mg/kg was identified in 148 residential yards during the PA. To calculate the resident population exposed to Level II contamination, the 148 residential samples exceeding the 400 mg/kg value was multiplied by the average number of persons per household in Allen County, 2.43. In addition, the grassy area surrounding two of the school yards sampled exceeded the KDHE RSK value of 400 mg/kg. The schools included the Jefferson Elementary School and the McKinley Elementary School. The enrollment at Jefferson is 224 students and at McKinley is 142 students (Great Schools 2007). The student population of these schools was added to the number of households whose residential yard samples exceeded the benchmark discussed above. The total Level II population is 725.64.

Workers

This factor value was assigned a score of 5 because there are workers with workplaces located on or within 200 feet of an area of observed contamination. The total number of workers is unknown; therefore, a value of 5 was assigned because the number of workers is known to exceed at least 1. The former United Zinc facility includes the following businesses: Brenntag Southwest, Inc. (Chemical Distribution Company), a MFA Distributor, the Superflea Flea Market, Tucker's Flea Market, a portion of a concrete mixing facility, and some pastureland. The facility is also surrounded by additional active businesses.

Resources

This factor value was assigned a score of 0 because no known commercial agriculture, silviculture, livestock production, or commercial livestock grazing is present on an area of observed contamination at United Zinc.

Terrestrial Sensitive Environments

This factor value was assigned a score of 0. Although several federally endangered and threatened species are listed as for Allen County by the Kansas Department of Wildlife and Parks (KDWP) (KDWP 2007), these have not been documented at the former United Zinc facility.

Soil and Air Pathways Conclusions

The likelihood of exposure value was assigned a value of 550 based on a release to the soil. This is based on arsenic and lead concentrations, identified during the PA in residential surface soil samples, exceeding the SCDM CR and RfD screening concentrations for arsenic and the KDHE RSK value for lead. Lead was the primary contaminant of concern during the field screening process during the PA. Therefore, lead was used to score the United Zinc site. Lead was detected at concentrations in 148 residential yards exceeding the KDHE RSK Residential Soil Pathway value of 400 mg/kg. The HWQFV was assigned a value of 100 based on the hazardous substance (lead) documented as present. A toxicity factor of 10,000 was assigned based on the hazardous constituent (lead) documented. Therefore, a waste characteristics value of 32 was assigned. The site was scored based on resident individual, resident population, potential targets, and workers.

The resident individual was assigned a score of 45 based on residents living or attending school or daycare on or within 200 feet of Level II contamination. The Level II target population is 725.64, computed by summing: (1) the product of the number of residential soil samples collected that exceed the KDHE RSK value times the average number of persons per household in Allen County plus (2) the student body total for both Jefferson Elementary School and the McKinley Elementary School. The workers factor was assigned a value of 5, the resources factor was assigned a value of 0, and the terrestrial sensitive environment was assigned a value of 0. This resulted in a targets factor category score of 775.64. Based on the likelihood of exposure, waste characteristics, and targets values, the site was assigned a groundwater migration pathway score of 100.

PRE-REMEDIAL CONSIDERATIONS

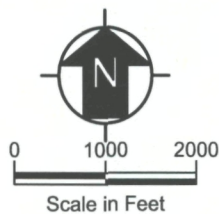
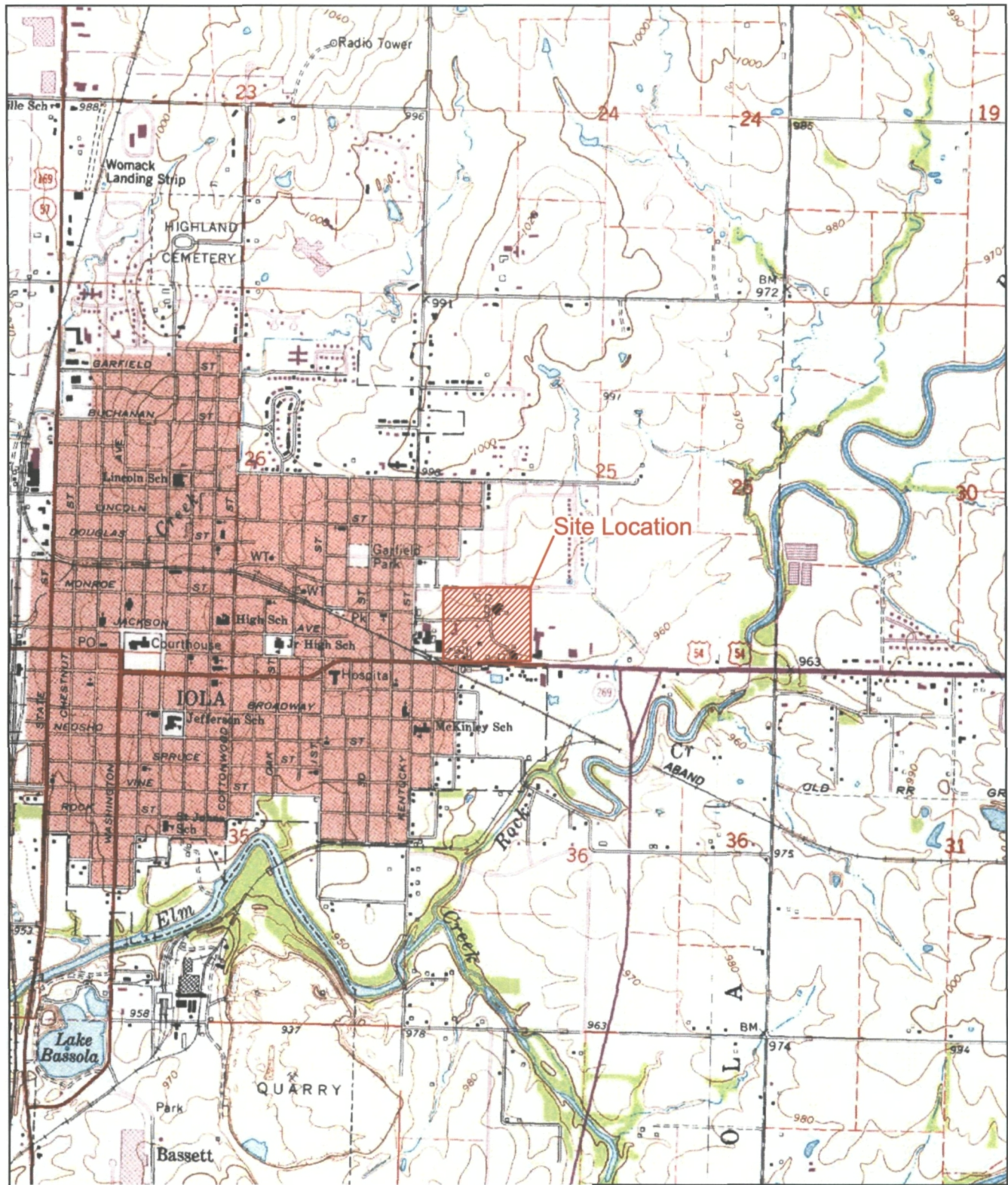
Tetra Tech supported ongoing RA and RSE investigations, including screening residential properties for possible soil contamination. Residential property screening forms are completed at each residence where surface soil samples are collected and screened. Further residential screening may be warranted to determine the extent of contaminated soil surrounding the former United Zinc facility, and to identify residential yards that contain contaminated soil with time-critical removal action levels. All of the sensitive properties including schools, daycares, and parks need to be addressed. Further pre-remedial

action and placement of the site on the National Priorities List may be necessary to fully address all environmental and health concerns.

REFERENCES

- Burns & McDonnell Engineering Company Inc. (Burns & McDonnell). 2004. Phase II Focused Former Smelter Assessment of the Former United Zinc #1 Smelter in Iola, Kansas. December.
- Great Schools. 2007. The Parent's Guide to K-12 Success. On-line Address: <http://www.greatschools.net/schools>. Accessed: February 2, 2007.
- Kansas Department of Health and Environment (KDHE). 2003. Risk-Based Standards for Kansas Manual. March 1.
- KDHE. 2005. Preliminary Removal Site Evaluation for United Zinc Smelter #1 Site in Iola, Kansas. September.
- KDHE. 2006. Bureau of Environmental Remediation/Remedial Section – A Short History of the Zinc Smelting Industry in Kansas. December 28.
- Kansas Department of Wildlife and Parks (KDWP). 2007. Threatened and Endangered Species in Allen County. On-line Address: <http://www.kdwp.state.ks.us>. Accessed: February 2, 2007.
- Kansas Geological Survey (KGS). 2007. KGS Index of Water Wells Database. Last updated January 1, 2007.
- Missouri Census Data Center. 2005. MABLE/Geocorr2K: Geographic Correspondence Engine with Census 2000 Geography. Version 1.2. On-line Address: <http://mcdc2.missouri.edu/websas/geocorr2k.html>. Accessed: January 16, 2007. Last updated: January 2007.
- Maxim Technologies, Inc. 2003. Focused Former Smelter Phase I Report. Group B Smelters. United Zinc #1 in Iola, Kansas. December 19.
- Terranext. 2005. Residential Yard Soil Sampling Report for United Zinc #1 in Iola, Kansas. June 27.
- Tetra Tech EM Inc. (Tetra Tech). 2006a. Removal Site Evaluation Report for United Zinc #1 Site. September 26.
- Tetra Tech. 2006b. Quality Assurance Project Plan for Integrated Site Assessment of the United Zinc #1 Site in Iola, Kansas. April 7.
- Tetra Tech. 2006c. Quality Assurance Project Plan for Removal Action of the United Zinc #1 Site in Iola, Kansas. August 10.
- United States Department of Agriculture. 1978. Soil Survey of Allen County, Kansas. November.
- U. S. Environmental Protection Agency (EPA). 1990. Hazardous Ranking System Final Rule, 40 CFR Part 300. December.
- EPA. 2004. Superfund Chemical Data Matrix (SCDM) Table. Washington, D.C. January.
- U.S. Geological Survey (USGS). 1984. Iola, Kansas, 7.5-minute topographic quadrangle.

APPENDIX A
FIGURES



United Zinc Lead Site
Iola, Kansas

Figure 1
Facility Location Map

 Tetra Tech EM Inc.

X:\G8004\0038.dwg\figure1.dwg

Source: USGS Allen County, KS 7.5 Minute Topo Quad, 1959, PR 1984

Date: 01/17/07

Drawn By: Bill Spiking

Project No: 19004.L06.0038.000



Legend

- Schools
- Slag Pile
- Highway
- Major Road
- Local Road
- Minor Road
- Other Road
- Property Boundary

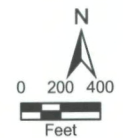
County Locator



Site Locator

Allen County

★ Site Location



Source: Allen Co., Kansas DOQQ Tileset, 2003
 Street Maps USA-ESRI Media Kit, 2001-2005
 MAXIM Technologies Inc. Figure 2 (Group B Lead Smelters), 2003

United Zinc Lead Site
 Iola, Kansas

Figure 2
 Facility Map



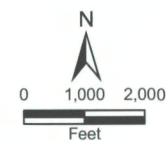


- Legend
- ⊕ Domestic well sample location
 - Soil sample location
 - Surface water sample location
 - Surface water and sediment sample location
 - ▭ Property Boundary

County Locator



Site Locator



Source: Allen Co., Kansas DOQQ Tiles, 2003
 Street Maps USA-ESRI Media Kit, 2001-2005
 MAXIM Technologies Inc. Figure 2 (Group B Lead Smelters), 2003

United Zinc Lead Site
 Iola, Kansas

Figure 3
 Sample Location Map



Date: 01/20/07 Drawn By: Chris Willis Project No: 00014-L-08-0108-001



- Legend**
- Schools
 - Lead Results between 400-800 mg/kg
 - Lead Results > 800 mg/kg
 - ✕ Slag Pile
 - ▭ Contaminated Soil Boundary
 - ▭ Property Boundary
 - Highway
 - Major Road
 - Local Road
 - Minor Road
 - Other Road

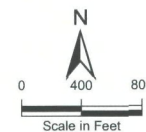
County Locator



Site Locator

Allen County

★ Site Location



Scale in Feet
Source: Allen Co., Kansas DOQQ Tileset, 2003
Street Maps USA-ESRI Media Kit, 2001-2005

United Zinc Lead Site
Iola, Kansas

Figure 4
Lead Concentrations Exceeding KDHE
Risk Residential Soil Pathway Value

TETRA TECH EM INC.

Date: 01/18/07 Drawn By: Colin White Project No: 06004.L 06/0036.000

APPENDIX B
QUICKSCORE VERSION 2.3 SCORESHEETS

**** CONFIDENTIAL ****
 ****PRE-DECISIONAL DOCUMENT ****
 **** SUMMARY SCORESHEET ****
 **** FOR COMPUTING PROJECTED HRS SCORE ****

**** Do Not Cite or Quote ****

Site Name: United Zinc

Region: 7

City, County, State: Iola, Allen County KS

Evaluator: Tetra Tech, Inc

EPA ID#: KSN000705026

Date: 01//2007

Lat/Long: 37.9222800 / 95.385900

T/R/S: 24S / 18E / 25 & 36

Congressional District:

This Scoresheet is for: SI

Scenario Name: SI

Description: Soil migration and surface water pathway evaluation

	S pathway	S ² pathway
Ground Water Migration Pathway Score (S _{gw})		
Surface Water Migration Pathway Score (S _{sw})	1.07	1.1449
Soil Exposure Pathway Score (S _s)	100	10000
Air Migration Score (S _a)		
$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10001.1449
$(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4$		2500.2862
$\sqrt{(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4}$		50.00

* Pathways not assigned a score (explain):

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Watershed Evaluated: Surface Water Pathway		
Drinking Water Threat		
Likelihood of Release:		
1. Observed Release	550	550
2. Potential to Release by Overland Flow:		
2a. Containment	10	
2b. Runoff	10	
2c. Distance to Surface Water	5	
2d. Potential to Release by Overland Flow [(lines 2a(2b + 2c)]	35	0
3. Potential to Release by Flood:		
3a. Containment (Flood)	10	
3b. Flood Frequency	50	
3c. Potential to Release by Flood (lines 3a x 3b)	500	0
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	0
5. Likelihood of Release (higher of lines 1 and 4)	550	550
Waste Characteristics:		
6. Toxicity/Persistence	(a)	10000
7. Hazardous Waste Quantity	(a)	100
8. Waste Characteristics	100	32
Targets:		
9. Nearest Intake	50	0
10. Population:		
10a. Level I Concentrations	(b)	0
10b. Level II Concentrations	(b)	0
10c. Potential Contamination	(b)	0
10d. Population (lines 10a + 10b + 10c)	(b)	0
11. Resources	5	5
12. Targets (lines 9 + 10d + 11)	(b)	5
Drinking Water Threat Score:		
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100	1.07
Human Food Chain Threat		
Likelihood of Release:		
14. Likelihood of Release (same value as line 5)	550	550
Waste Characteristics:		
15. Toxicity/Persistence/Bioaccumulation	(a)	
16. Hazardous Waste Quantity	(a)	100
17. Waste Characteristics	1000	0
Targets:		
18. Food Chain Individual	50	
19. Population		
19a. Level I Concentration	(b)	
19b. Level II Concentration	(b)	
19c. Potential Human Food Chain Contamination	(b)	
19d. Population (lines 19a + 19b + 19c)	(b)	
20. Targets (lines 18 + 19d)	(b)	
Human Food Chain Threat Score:		
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100	0
Environmental Threat		
Likelihood of Release:		
22. Likelihood of Release (same value as line 5)	550	
Waste Characteristics:		
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	
24. Hazardous Waste Quantity	(a)	100
25. Waste Characteristics	1000	

Targets:

26. Sensitive Environments	
26a. Level I Concentrations	(b)
26b. Level II Concentrations	(b)
26c. Potential Contamination	(b)
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)
27. Targets (value from line 26d)	(b)

Environmental Threat Score:

28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60
---	----

Surface Water Overland/Flood Migration Component Score for a Watershed

29. Watershed Score ^c (lines 13+21+28, subject to a max of 100)	100	1.07
--	-----	------

Surface Water Overland/Flood Migration Component Score

30. Component Score (S_{sw}) ^c (highest score from line 29 for all watersheds evaluated)	100	1.07
---	-----	------

^a Maximum value applies to waste characteristics category

^b Maximum value not applicable

^c Do not round to nearest integer

TABLE 5-1 --SOIL EXPOSURE PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Likelihood of Exposure:		
1. Likelihood of Exposure	550	550
Waste Characteristics:		
2. Toxicity	(a)	10000
3. Hazardous Waste Quantity	(a)	100
4. Waste Characteristics	100	32
Targets:		
5. Resident Individual	50	45
6. Resident Population:		
6a. Level I Concentrations	(b)	
6b. Level II Concentrations	(b)	725.64
6c. Population (lines 6a + 6b)	(b)	725.64
7. Workers	15	5
8. Resources	5	0
9. Terrestrial Sensitive Environments	(c)	0
10. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)	775.64
Resident Population Threat Score		
11. Resident Population Threat Score (lines 1 x 4 x 10)	(b)	13651264
Nearby Population Threat		
Likelihood of Exposure:		
12. Attractiveness/Accessibility	100	
13. Area of Contamination	100	
14. Likelihood of Exposure	500	
Waste Characteristics:		
15. Toxicity	(a)	
16. Hazardous Waste Quantity	(a)	
17. Waste Characteristics	100	
Targets:		
18. Nearby Individual	1	
19. Population Within 1 Mile	(b)	
20. Targets (lines 18 + 19)	(b)	
Nearby Population Threat Score		
21. Nearby Population Threat (lines 14 x 17 x 20)	(b)	
Soil Exposure Pathway Score:		
22. Pathway Score ^d (S_p), [(lines (11+21)/82,500, subject to max of 100)]	100	100

^a Maximum value applies to waste characteristics category

^b Maximum value not applicable

^c No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60

^d Do not round to nearest integer